

# Large Area Photodetector Development:

## Hermetic Packaging Godparent Review Overview

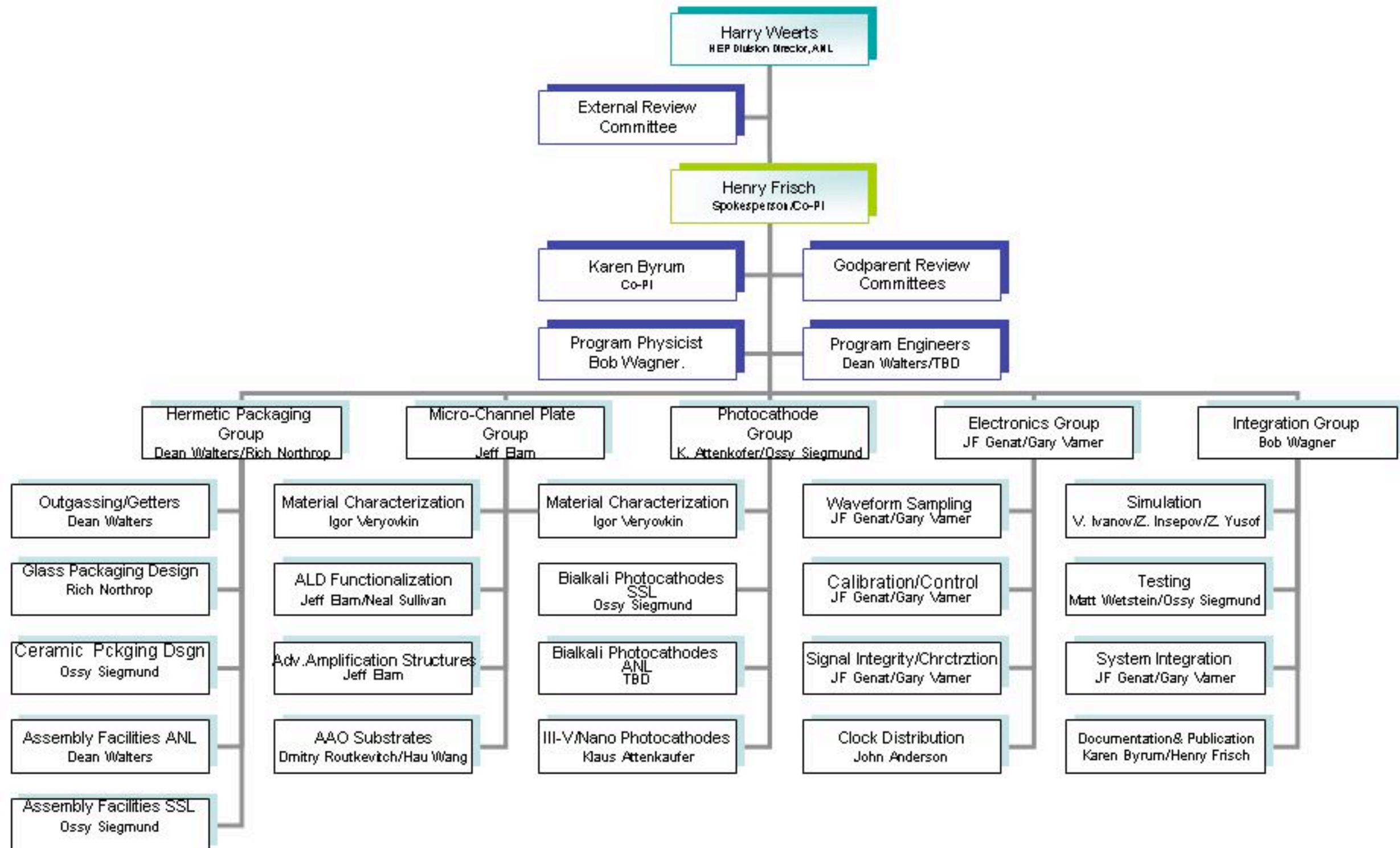


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# Organization Chart

## R&D Program for the Development of Large-Area Fast Photodetectors

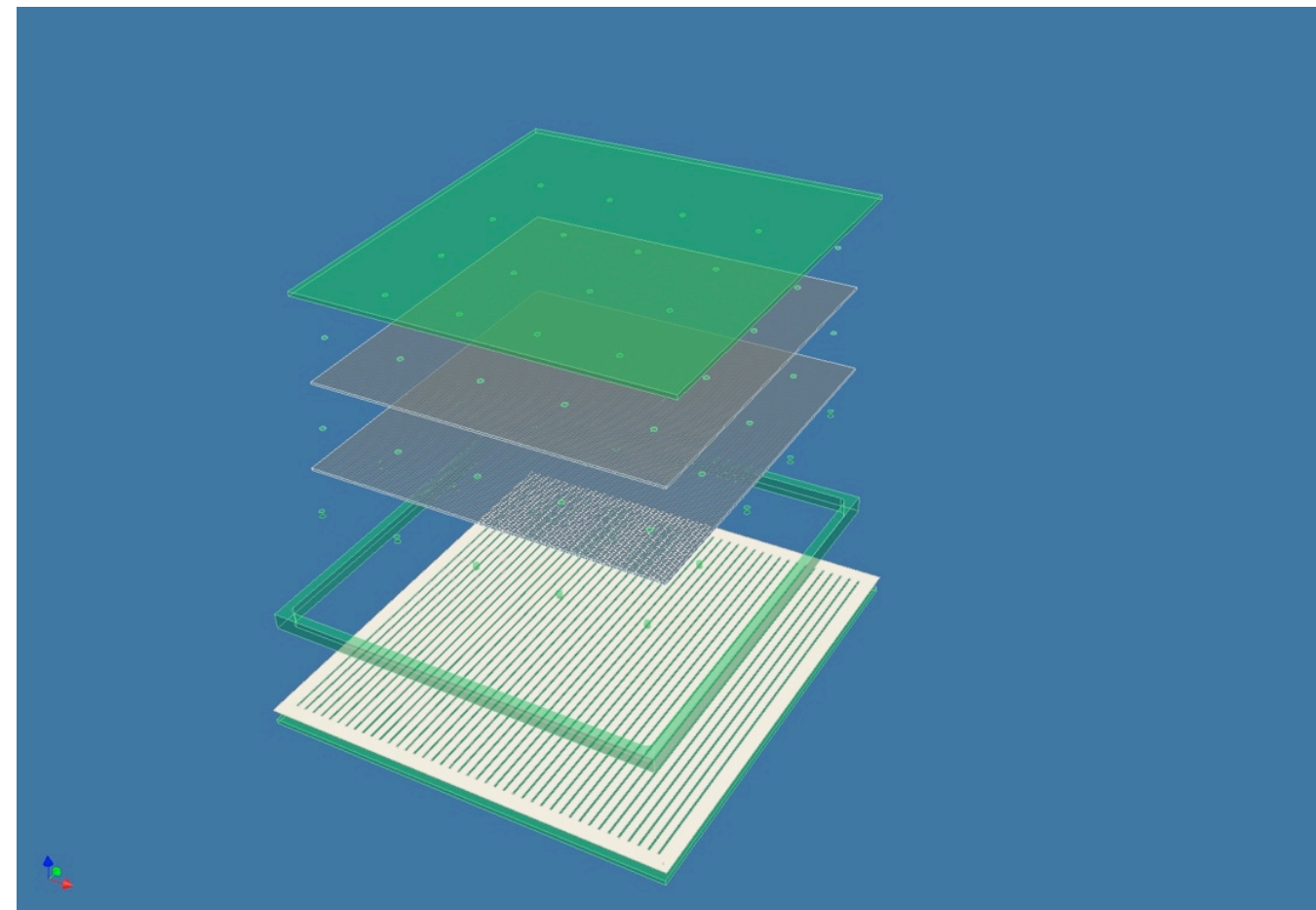


# MCP Hermetic Package Alternatives

- ▶ Space Science Laboratory
  - Ceramic tray, pins penetrating tray bottom for HV & stripline readout, indium seal for cathode top plate to ceramic tray
  - Builds on known techniques -- expectation of success
- ▶ University of Chicago / Argonne
  - Glass bottom plate with stripline
    - *Inside-Out* stripline with anode on air side of bottom plate *or* anode lines inside extending under glass sidewall
    - Pins penetrating bottom plate connecting to stripline -- not pursuing this option at present
  - Glass sidewall bonded to bottom plate -- frit or possibly same as sidewall/top plate seal
  - Seal glass photocathode top to sidewall
    - indium, indium/tin, indium/gold
    - just started first tests
  - Less expensive materials and fabrication; techniques to be demonstrated
- ▶ Assembly alternatives
  - Ultra-high Vacuum transfer chamber for photocathode fabrication, assembly and seal of all pieces
  - UHV fabrication of photocathode. Assembly, pump out and seal in inert gas atmosphere glove box

# LAPD Mechanical Assembly & Sealing: Requirements

- ▶ Maintain 50Ω impedance of strip line
- ▶ Strip line adhesion to bottom glass plate surface
- ▶ Low outgassing from components to achieve UHV in sealed tube
- ▶ Achieve hermetic seal of top plate and for glass option, sidewall to bottom plate
- ▶ Avoid damage to photocathode throughout assembly process
  - load-lock transfers
  - thermal processing
  - chemicals and outgassing
- ▶ Maintain integrity of microchannel plate, strip line, and spacers during transfers and assembly



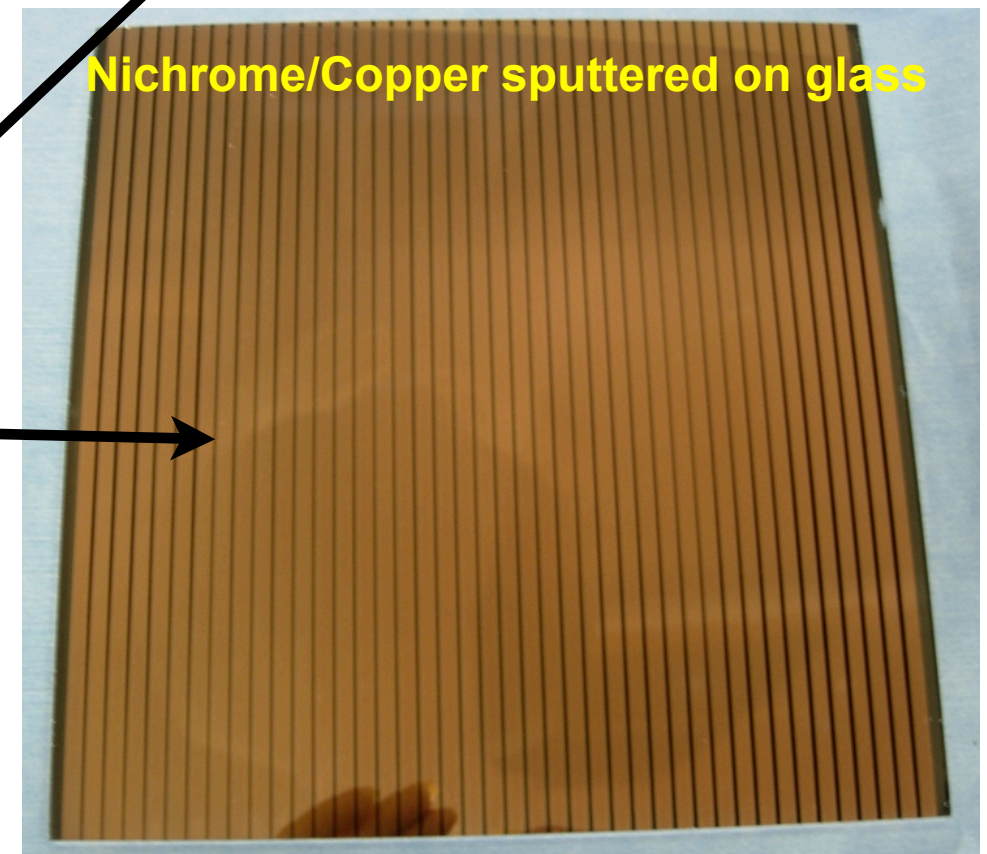
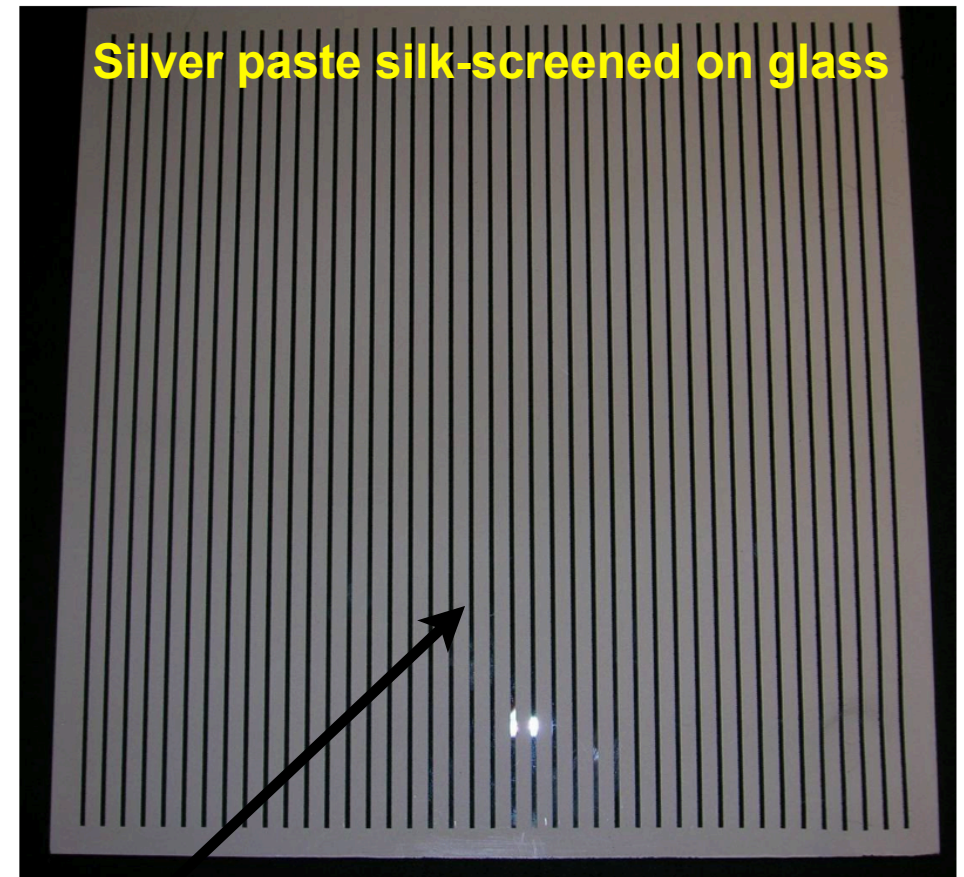
Concept of components & assembly:  
one of several alternatives



# Strip Line Fabrication

- ▶ Adherence to glass or ceramic
- ▶ Compatible with photocathode material?
  - Silver paste – machine screened by outside vendors
  - Silver/Palladium – SSL
  - Nichrome/Copper – Argonne on hold
- ▶ Application technique
  - Silk-screening – Silver paste on glass
    - baseline choice for all glass container
  - Sputtering – Argonne
  - Evaporation – outside vendor
- ▶ External connection
  - Anodes on outside, ground strips inside
  - Strips extended through outer body
  - Strips connected to penetrating pins
  - Metal plating through vias to pins – SSL

} successful fallback  
for silver paste



# Focal Points for Godparents

- ▶ Assembly of 8"×8" MCP
  - SSL has defined plan for vacuum transfer setup
  - How to proceed at Argonne
    - develop vacuum assembly
    - test photocathode in inert gas assembly
    - where to fabricate photocathode
- ▶ Strip line fabrication with silk-screened silver paste
  - Impedance of line is right on
  - Outgassing is low and can be handled by getters
  - Need to demonstrate sidewall/bottom plate bond
    - glass frit between silver and glass sidewall
    - indium/indium alloy joint between silver and glass sidewall
- ▶ Demonstration of sealing glass top plate to glass sidewall
  - Nichrome/indium/nichrome or similar combination??
- ▶ Fabrication of “empty box” for demonstrating glass seals
- ▶ Photocathodeless MCP to demonstrate working detector producing gain

